

JSC Policy Directive

JPD 1800.2A

EFFECTIVE DATE: 6/05/03

EXPIRATION DATE: 6/05/08

RESPONSIBLE OFFICE: SA/Space and Life Sciences

SUBJECT: Decompression Sickness

1. POLICY.

1.a. This Policy Directive establishes the policy for the medical disposition of human test personnel and crew members who incur decompression-related disorders. It also serves to describe the communication, monitoring, and oversight requirements for test subjects and/or crew members engaged in activities that involve pressure excursions with the potential to result in decompression-related disorders.

1.b. Operations involving environmental pressure changes are inherently hazardous with risk of incurring decompression-related injuries including but not limited to decompression sickness, arterial gas embolism, other forms of pulmonary barotrauma, ear barotrauma, and combinations of the above. Specific operations will include, but not be limited to, altitude chamber physiologic training; vacuum chamber training and/or engineering evaluation; water immersion training or scuba diving in the JSC Neutral Buoyancy Laboratory (NBL), other NASA Centers, and NASA-sponsored off-site water immersion facilities; high-performance aircraft operations; and space operations including extravehicular activity (EVA).

*1.c. All individuals involved in the operations delineated above must be keenly aware of these hazards and be vigilant in maintaining the highest safety standards. Although every member of the test or operations team is responsible for the safe conduct of a test or operation, a key responsibility in maintaining high safety standards rests with the individual test subject or crew member. These persons must be capable of recognizing the onset of a symptom and must immediately report that the symptom has occurred. An appropriate hazard briefing and review of potential symptoms will be provided before undergoing a pressure change activity. Only in such a manner can the appropriate medical and safety actions be taken to resolve the problem. The intent of this JPD is to clearly define the requisite communication requirements and medical disposition of a crew member or test subject who has experienced a decompression-related injury, and to provide post-recovery guidance to both the test subject or crew member, and to management.

1.d. Every test subject and every crew member who participate in operations as delineated above are required to immediately report the onset of any of the following symptoms:

1.d(1) Mild Decompression Sickness (DCS) Type I

1.d(1)(a) Mild Decompression Sickness (DCS) Type I. Symptoms involving joint pain, peripheral nervous system, or simple skin bends.

1.d(1)(b) For aircraft/chamber operations, individuals encountering Mild DCS where symptoms resolve upon descent to 1-atmosphere, after breathing 100% oxygen, or after appropriate hyperbaric chamber treatment may be cleared to return to duties not involving expected ambient pressure change 24 hours following resolution of the symptoms. These individuals may be cleared by appropriate medical personnel to engage in variable pressure change-related activities 72 hours after resolution of the symptoms.

1.d(1)(c) For spaceflight, individuals may return to ambient cabin pressure duties 24 hours after resolution of symptoms. If DCS symptoms resolve upon repressurization to cabin pressure, the crew members may return to pressure change-related duties in 72 hours, otherwise 7 days after symptoms resolve.

1.d(2) Repetitive Mild Decompression Sickness (DCS) Type I Event

1.d(2)(a) Repetitive Mild Decompression Sickness (DCS) Type I Event. Symptoms involving joint pain, peripheral nervous system, or simple skin bends that have occurred previously within the past 30 days for ground-based exposure and within a single flight for spacecraft operations.

*1.d(2)(b) For aircraft/chamber operations, individuals encountering Repetitive Mild DCS where symptoms resolve upon descent to 1-atmosphere, after breathing 100% oxygen, or after appropriate hyperbaric chamber treatment may be cleared to return to duties not involving expected ambient pressure change 24 hours following resolution of the symptoms. These individuals may be cleared to engage in variable pressure change-related activities on a case-by-case consideration by the Aerospace Medicine Board (AMB).

1.d(2)(c) For spaceflight, individuals may return to cabin pressure duties 24 hours after resolution of symptoms. All cases regarding return to reduced-pressure exposure will require consideration by the AMB.

1.d(3) Cutis Marmorata (CM), also described as Skin Marbling or Skin Mottling

1.d(3)(a) Cutis Marmorata (CM). A sign of DCS that appears on the skin as a mottled pattern.

1.d(3)(b) For aircraft/chamber operations, individuals encountering CM where sign resolves upon descent to 1-atmosphere, after breathing 100% oxygen, or after appropriate hyperbaric chamber treatment may be cleared to return to duties not involving expected ambient pressure change 24 hours following resolution of the sign. These individuals may be cleared to engage in variable pressure change-related activities on a case-by-case consideration by the AMB.

1.d(3)(c) For spaceflight, individuals may return to cabin pressure duties 24 hours after resolution of sign. All cases regarding return to reduced pressure exposure will require consideration by the AMB.

1.d(4) Serious Decompression Sickness (DCS) Type II

1.d(4)(a) Serious Decompression Sickness (DCS) Type II. Symptoms involving the central nervous system, cardiovascular system, or pulmonary system.

1.d(4)(b) For aircraft/chamber operations, individuals encountering Serious DCS may be cleared to return to 1-atmosphere-related duties 48 hours following resolution of symptoms. These individuals may be cleared to engage in variable pressure change-related activities on a case-by-case consideration by the AMB.

1.d(4)(c) For spaceflight, individuals may return to ambient cabin pressure duties 48 hours after resolution of symptoms. All cases regarding return to reduced pressure exposure will require consideration by the AMB.

1.d(5) Arterial Gas Embolism

1.d(5)(a) Arterial Gas Embolism. Evolved gas-producing symptoms and signs consistent with passage of the gas to the arterial circulation, i.e., severe neurological manifestations.

1.d(5)(b) For aircraft/chamber operations and spaceflight, return to duty and return to reduced-pressure environments require review by the AMB.

1.d(6) Medical Constraints

1.d(6)(a) All medical data relating to a decompression disorder will be kept confidential consistent with the Privacy Act.

1.d(6)(b) Current definitions are clinically based and consistent with commercial and military diving and aviation policies. No administrative decision on flying duties will be based on Doppler-detectable bubbles.

1.d(6)(c) All in-flight DCS events that do not resolve with available treatment options, as well as complicated Type II events, may be grounds for medical return and mission termination.

2. APPLICABILITY. This JPD applies to all JSC personnel and organizational elements planning for, performing, participating in, or supervising human-in-the-loop testing, research, training, or operations within hazardous environments at, under the control of, or sponsored by JSC.

3. AUTHORITY.

3.a. Executive Order 12196, Occupational Safety and Health Programs for Federal Employees.

3.b. Title 29 CFR Code of Federal Regulations.

*3.b(1) 29 CFR 1910, Occupational Safety and Health Standards.

*3.b(2) 29 CFR 1913, Rules of Agency Practice and Procedure Concerning OSHA Access to Employee Medical Records.

*3.b(3) 29 CFR 1925, Safety and Health Standards for Federal Service Contracts.

*3.b(4) 29 CFR 1960, Basic Program Elements for Federal Employee Occupational Safety and Health Programs and Related Matter.

*3.b(5) 29 CFR 1977.22, Employee Refusal to Comply With Safety Rules.

3.c. NASA Policy Directive (NPD) 8710.2, NASA Safety and Health Program Policy.

*3.d. NPG 8715.1, NASA Safety and Health Handbook - Occupational Safety and Health Programs.

*3.e. JSC Procedures and Guidelines (JPG) 1700.1, JSC Safety and Total Health Handbook.

4. REFERENCES.

4.a. NPD 7100.8, Protection of Human Research Subjects (with addendum: Astronauts and Informed Consent).

4.b. JPG 1700.1, JSC Requirements Handbook for Safety, Health, and Environmental Protection.

4.c. JSC Policy Directive (JPD) 1830.2, Physiological Training Program.

*4.d. JPD 1830.3, Limitations Applicable to Personnel Exposed to Diving.

4.e. JMI 1830.4, Medical Support Requirements for Manned Testing and Training.

4.f. JSC Form 209, Application and Record of Qualification for Personnel Certification.

4.g. JSC Form 1416, NASA/JSC Human Research Informed Consent (Minimal or Reasonable).

4.h. STB-F-001, Crew and Thermal Systems Division Standard Operating Procedures Manual.

*4.i. JPD 8080.4, Exposure to Reduced Atmospheric Pressure.

5. RESPONSIBILITY.

5.a. All directorates and offices at JSC are specifically and jointly responsible for ensuring compliance with the requirements of this JPD. The specific responsibilities and medical requirements associated with implementing this JPD and conducting safe pressure change-related tests, research, training, or operations are delineated in JPG 1800.3, "Decompression Sickness Procedures and Guidelines," and its appendices and can be generally categorized as follows:

5.a(1) Appendix I. Ground-Based Engineering Evaluations and Crew Member Training in Vacuum Chamber and Water Immersion Facilities. Document update responsibility, Engineering Directorate.

5.a(2) Appendix II. Ground-Based Scientific Experiments Relating to Hypobaric and Hyperbaric Environments. Document update responsibility, Space and Life Sciences Directorate.

5.a(3) Appendix III. Flight Crew and NASA Aircraft Operations. Document update responsibility, Flight Crew Operations Directorate.

5.b. The overall responsibility, accountability, and implementation of this JPD and its updates rest with the Space and Life Sciences Directorate. The EVA Project Office will actively participate in the updates of this JPD and its implementation instruction.

6. METRICS.

6.a. Specific metrics to be measured are delineated in each Appendix of JPG 1800.3, "Decompression Sickness Procedures and Guidelines."

6.b. Overall responsibility for collection of metrics lies with the Space and Life Sciences Directorate, which will perform annual reviews to ensure appropriate medical and administrative disposition.

* denotes change.

<Original signed by Jefferson D. Howell, Jr. 6/05/03>

Jefferson D. Howell
Director

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